

Lumbar With Flexwires in Cross

Cross-Reference to Related Applications

5 None.

Statement Regarding Federally Sponsored Research or Development.

Not Applicable.

Appendix.

Not Applicable.

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Background of the Invention

1. Field of the Invention

The present invention relates generally to lumbar support devices. More particularly, the present invention is a lumbar support device in the seat back of a vehicle seat for supporting an occupant's lumbar region. The present invention involves a lumbar support device comprising a wire framework having two side rails adapted to be suspended in a seat frame and between which extend a plurality of transverse wires. The present invention is designed with cross-bars to create a stiffer lumbar feeling without creating a "hole" effect just above the lumbar region.

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2. Related Art

Lumbar support systems are important for assisting an individual in achieving an anatomically correct seating posture. Incorrect seating posture can lead to lower back pain, increased muscle activation, increased tension on ligaments, and increased pressure on the spine.

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Moreover, lack of lumbar support causes discomfort to the individual in the seated position. Particularly in a car seat, the problems that stem from incorrect seating posture, *i.e.* lower back pain and uncomfotability, may lead to reduced concentration and reduced driving safety. Accordingly, it is important for a car seat to have the correct lumbar support for both the comfortability of the driver and for his or her safety.

The known lumbar support devices do not effectively support the lumbar region. Some of these lumbar supports are ineffective because the whole seat moves forward instead of just the lumbar region. This does not effectively support the lumbar region. Further, other lumbar supports that move independently of the seat do not provide the effective support. Often a hole effect occurs in which there is a gap in the support of the lower back. Moreover, these support systems are not stiff or durable. Support systems with baskets add increased stiffness and durability. However, baskets often result in a punctual effect. This punctual effect occurs because the lumbar support is restricted to one line or one point. Moreover, some of the supports with baskets create an aggressive situation which is not comfortable to the individual. These baskets are also more expensive to manufacture than lumbar supports without baskets because they require more material and labor. In the past, efforts have been made to stiffen the lumbar area by extra wires, such as extra horizontal wires in U.S. Patent Nos. 6,152,531 and 5,988,745, as well as other techniques. However, many prior art devices continue to produce the hole effect above the stiffer lumbar area.

Summary of the Invention

One aspect of the present invention relates to a lumbar support device having a pair of side rails, a plurality of transverse wires extending between the side rails, a pair of cross bars extending

between the side rails, a seat frame, and an actuator assembly which operatively connects to the side rails and seat frame to change the curvature of the lumbar support device. It is the main object of this present invention to provide cross-bars in the lumbar region to create stiffer lumbar support without creating a “hole” effect just above the lumbar region. The present invention is also
5 designed with cross-bars to eliminate the “punctual effect” that occurs with lumbar support devices.

Another aspect of the present invention pertains to the lumbar support device comprising cross-bars that may be connected at varying points on the side rails to adjust the apex height. The present invention may also be designed with cross-bars having greater average bending stiffness than the transverse wires. This increased average bending stiffness provides increased stiffness in
10 the lumbar region.

Another aspect of the present invention pertains to the lumbar support device comprising transverse wires with varying degrees of average bending stiffness. The varying bending stiffness provides varying curvature change in various portions of the seat back. Accordingly, the present invention is designed to provide adequate comfort in each area of the seat.

15 In another aspect of the present invention, the support device may also be used in a seat base, chair, or other arrangements wherein the contour of a seat cushion is desired to be adjusted.

In another aspect of the present invention, the support device may be designed with bends in the transverse wires. These bends create an increased suspension effect which increases comfort.

20 It is the purpose of the present invention to provide a lumbar support device that is simple and affordable to manufacture. The present invention may be manufactured from a normal outline by increasing the length of the side rails. The side rails may be pre-bended near their

ends in one of the first steps of the outline. Then, the side rails may be bended in a shepherd hook formation and clipped together on the opposite side rail.

It is a further purpose of the present invention to provide a lumbar support device with increased durability.

5 It is a further purpose of the present invention to provide a mechanically simplified lumbar support device that provides the appropriate stiffness in the lumbar region without creating a “hole” effect.

Further features and advantages of the present invention, as well as the structure and operation of various embodiments of the present invention, are described in detail below with
10 reference to the accompanying drawings.

Brief Description of the Drawings

The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and together with the description, serve to explain the principles of the invention. In the drawings:

15 Figure 1 illustrates the preferred embodiment of the lumbar support device installed in a seat frame.

Figure 2 illustrates a front view of the preferred embodiment of the lumbar support device.

Figure 3 illustrates the preferred embodiment of the lumbar support device having bends in the cross.

Detailed Description of the Preferred Embodiments

20 As shown in Figures 1-3, the preferred embodiment of the lumbar support device (8) for a seat back of a vehicle includes a pair of side rails (10 and 12) having first ends (14 and 16) and

second ends (18 and 20). The side rails (10 and 12) are comprised of paper wrapped or plastic coated steel wire. Side rail (10) is angled at (10A) and the second end (18) of side rail (10) is attached to side rail (12). Side rail (12) is angled at (12A) and the second end (20) of side rail (12) is attached to side rail (10). These attachments are made by clips (22 and 24). These connections
5 form a cross or X-shape (26). The side rails may incorporate bends (26A) in the cross as shown in Figure 3. A plurality of transverse supporting wires (28) are provided between the side rails (10 and 12). These transverse supporting wires (28) are wound around the side rails (10 and 12) to fixedly attach. However, the transverse supporting wires may be fixedly attached to the side rails by other means known in the art or any equivalents developed in the future. These transverse supporting
10 wires (28) are angled (28A) so that they form sinuous wire springs allowing for limited transverse stretching of the platform element. The transverse supporting wires (28) may be interconnected at their mid points by a central longitudinal cord or tube (30). The transverse supporting wires (28) penetrate the central longitudinal cord (30).

In the preferred embodiment, one or a plurality of the transverse supporting wires (28) is
15 wound around the side rails (10 and 12) and extends past the side rail to attach frame. This attachment suspends the platform in the seat frame (52). However, this suspension may be achieved by other means known in the art, such as wire links, or any equivalent developed in the future.

In the preferred embodiment, a pair of brackets (32 and 34) are fixedly attached to the side rails (10 and 12). A pair of Bowden cables (36 and 38) have first ends (40 and 42) and second ends
20 (44 and 46), respectively. The first ends (40 and 42) of the Bowden cables are slidably inserted through brackets (32 and 34), respectively. The second ends of the Bowden cables (44 and 46) are

fixedly attached to a manually actuatable adjusting mechanism (48). The first ends (40 and 42) link to a seat frame by anchor portions (48 and 50).

Upon actuation of the cable mechanism, the position of the lumbar support device (8) that is linked to the Bowden cables (44 and 46) extends in a concave shape relative to the seat frame.

5 Thus, the degree of lumbar support provided by the platform element can be increased by actuation of the mechanism. In the preferred embodiment, only the contour of the lumbar support device (8) is displaced rather than the platform element itself.

In view of the foregoing, it will be seen that the several advantages of the invention are achieved and attained. For example, the pair of cross bars extending between the side rails and the
10 plurality of transverse wires extending between the side rails for the lumbar device in the seat frame allow for curvature of the lumbar support device while also providing stiffer lumbar support and without resulting in the undesired "hole" effect in and around the lumbar region. The cross-bars also reduce the "punctual effect" that occurs with other similar lumbar support devices. As discussed above, the cross-bars that may be also be connected at varying points on the side rails
15 and this can be useful in adjusting the apex height, while other embodiments may also be used with actuators to translate the lumbar within the seat. The cross-bars also provide greater average bending stiffness than the transverse wires alone, which can provide increased stiffness in the lumbar region. Varying the bending stiffness can provide varying curvature change in different portions of the seat back. As also discussed above, the support device according to the present
20 invention may also be used in a seat base, chair, or other arrangements, such as wherein the contour of a seat cushion is desired to be adjusted. Further, the support device may be designed with bends in the transverse wires which can increase the suspension effect of the device.

Additionally, the lumbar support device is simple and affordable to manufacture and with improved durability. For example, the preferred embodiment of device is a mechanically simplified lumbar support device in comparison to many other types of lumbar devices, yet it provides good stiffness in the lumbar region without creating a “hole” effect and will be less prone to fail than more complicated designs. The present invention may be manufactured from a normal outline by increasing the length of the side rails. The side rails may be pre-bended near their ends in one of the first steps of the outline. Then, the side rails may be bended in a shepherd hook formation and clipped together on the opposite side rail.

The embodiments were chosen and described in order to best explain the principles of the invention and its practical application to thereby enable others skilled in the art to best utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated.

As various modifications could be made in the constructions and methods herein described and illustrated without departing from the scope of the invention, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative rather than limiting. For example, while the present invention is primarily designed to be used in a seat back, it will be appreciated that embodiments of the present invention may also be used in a seat base, chair, or other arrangements wherein the contour of a seat cushion is desired to be adjusted. As yet another example, although the preferred embodiment of the present invention uses clip attachments for connecting the two cross rails and forming a cross, it will be appreciated that other attachments may be used such as a clip, screw, clasp, as well as any other equivalent type of attachment which may now be known or developed in the future. For example,

even though the preferred embodiment is disclosed with discrete attachments, it will be appreciated that the connections between the side rails can be made by winding one cross rail around the other cross rail in a manner that is equivalent to the winding of the transverse supporting wires (28) around the side rails (10 and 12). Thus, the breadth and scope of the present invention should not be
5 limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims appended hereto and their equivalents.